The Builder.
NO. LVI.

SATURDAY, MARCH 2, 1844.

AGAIN resuming the subject of Bridges, we come to matters no less important than those of which we have already treated. We had arrived in our 53rd Number (p. 61) at the *key-stone*, and there gave some rules upon the matter: we now proceed in our theories by stating—

13thly. The bridge-builder's most scientific address is shewn by increasing the abutment, and diminishing the work hanging in jeopardy, to the utmost limits, without burthening the foundation.

14thly. Hence those who buoy up a key-stone by an increase of extraneous abutment, though they succeed, do so at great extra expense of material; the weight of which on weak foundations would cause failure through sinking, and even, though at present successful, lead to ultimate failure through any accidental derangement of the foundation.

15thly. The relative increase of abutment, and the diminution of parts in jeopardy, should therefore be effected within the arch itself, without any increase of material.

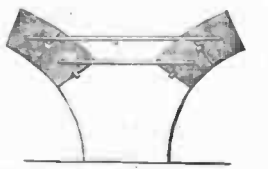
16thly. All the parts of an arch which would not fall off their beds if the remainder of the arch were removed, form abutment.

17thly. High Gothic or Pointed arches, may be so formed as to be all abutment and to have none of their own parts in jeopardy.

18thly. Circular Segmental arches, flat Catenarian arches, and flat Two-centred Pointed arches, may be so formed as to have all their parts in jeopardy, and to have none of their parts forming abutment.

19thly. Higher Catenarian arches, Elliptical arches, and Four-centred or Tudor Pointed arches, may be so made that a portion of their work may form abutment, the remainder hanging in jeopardy; they all approach excellence, as their parts in jeopardy diminish, and those forming abutment increase.

20thly. In all bridges, consisting of a series of arches, the quantity of work in jeopardy may be greatly diminished by causing some of the voussoirs which would fall over from their beds on one side of a pier to be counter-balanced by being tied by metal (as iron or copper) to those of the arch on the other side of such pier; so that if the *active force* of the parts of an



arch in jeopardy, amounting to a hundred tons, were sustained by a strength in the pier amounting to only a hundred tons, the structure would be ready to fall; but if fifty tons of the work in jeopardy were added to the pier, the work to be sustained would be only fifty tons, and the sustaining abutment would become one hundred and fifty tons, without one ounce-weight being added to the work except from the gravity of the ties. But in such case a great diminution of the sustaining parts of the structure might be with safety made, thence rendering the work at once cheaper, lighter, and more secure.

ROYAL POLYTECHNIC INSTITUTION.

DR. KEENAN'S LECTURES.

ON Saturday, Feb. 17, Dr. Keenan delivered his fourth lecture at the above institution. The subject of this lecture was "the adaptation of the constitution to particular climates and occupations." The lecturer began by observing that when rain was coming on, particularly after long droughts, many persons felt a great reduction of strength and spirits, and at the same time it might be observed that the fire upon the hearth burned less briskly; the latter fact was clearly attributable to the less rapid combination of air with the fuel; and since it was previously proved that the movements of the animal machine resulted from the combination of air with respiratory food, such as butter, wine, &c., the diminished strength of body would be expected *à priori* to be contemporaneous with diminished combustion, as in this state of the weather the air had a diminished affinity with the elements of food. These, consequently, accumulated in the system, and assumed the form of fat; so that the act of growing fat is the act of storing up in the body what, in a favourable condition of the atmosphere, would be oxydized for the production of strength; and here the lecturer called the attention of the audience to the fact, that the force which actuated the electro-magnetic machine on the table before him resulted from vital air combining with zinc, that whatever increased combination increased the force of that machine, and whatever diminished the one diminished the other also; accordingly, if a person in Lincolnshire, where the situation is low, damp, swampy, and which therefore tends to induce a permanent state of the air, analogous to that which in Paris precedes rain, finds himself getting fat, and at the same time languid and spiritless, if he knew the true function of the lungs he would say to himself, "I am not to eat my food to be accumulated in my body for the sake of bulk.—I am not to carry about with me a portable pantry. I shall seek an air that by chemically combining with my butter and beer, shall result in electro-energy;" and, accordingly, he would betake himself to the Welsh mountains, or to Paris, or still better, to some of the mountains of Switzerland. Here that which in a stagnant and damp air accumulated in the form of fat, would be used as material actuating both body and mind. Effects similar to those of Paris and the Switzerland mountains may be felt at Brighton, or, in a word, any where where the air is dry and in brisk motion.

LAST Saturday Dr. Keenan resumed his course of lectures at this institution. He commenced by observing that the object of the present lecture was to trace the influence of physical causes on the moral and intellectual faculties, as well as on taste. From what had been said in the preceding lectures, he trusted he might assume as proved, that the strength or energy of the human body was to be measured by the quantity of air that the act of breathing could force into chemical combination with digested food (in the form of venous blood). To illustrate this he referred to the galvanic pile upon the table, which he said was proportionable to the metal of the battery. That that energy might be used for any given purpose, but then it could not, at the same time, be used for any other. In like manner, the electro-energy generated in the breathing, which confers strength or vital cohesion on the textures of the body, energy on the muscles for the purpose of locomotion, and on the brain the power to sustain thought and feeling, if predominantly expended on one of these departments of the animal machine, shall necessarily be defective in others. Hence it was that an athletic youth, coming from the country, with great muscular power, to commence his collegiate studies, often exhibited, before the end of his course, as great a reduction in the firmness of his bodily textures and of his strength in enduring fatigue, as he exhibited an increase of the vigour and perfection of the cerebral actions involved in the development of thought. If by literary ambition, or the stimulus of parents or teachers, such a youth should long sustain the disturbance of his nervous energy, by keeping it constantly on the brain, the declining vigour of his other organs will warn him, though often too late, of his fatal mistake; and in this way scrofula, whether in the form of consumption, king's evil, white swelling of the knee-joint, inflamed eyes, or by other developments, is often produced. The lecturer then remarked, that among those who approached as near the truth as to know that the human body is actuated by electricity, almost all considered the brain as the organ of its production; this, however, was a grave mistake, and quite unsupported by the facts of science; for the production of electricity for the purposes of motion implied the expenditure of materials, and while these materials were to be found exactly of the kind required in food and air, they were not to be found in cerebral matter. The mistake is dangerous, if carried out, in its consequences; for if a weak boy, of a flaxy fibre, that is, of too little energy, were to be treated upon this principle, we ought to exercise the brain, and as far as possible sustain it in action, in order that it might manufacture strength for the enfeebled body; but the facts of the case would shew such procedure a good way of *weakening* further, instead of conferring strength. On the contrary, let but the exact way in which strength is generated be understood, viz., by the action of air on digested food—that the quantity of strength is proportioned to the available quantity of breathing—that the brain, instead of generating, receives its energy from the lungs, and we shall be in the sure track for finding improvement. For this purpose, by proper exercise, we should enlarge the thorax, select a food easy of digestion, that is, easily disposed to combine with air, and an air which from its dryness and brisk motion is disposed to combine with all the motor food instead of leaving a residue in the blood assuming the form of bilious accumulation.

Dr. Keenan then proceeded to shew the effects of different climates on the moral and intellectual faculties. He appealed to the audience whether they had never felt when the digestion was going on badly, when rain was coming on, &c., less intensity in their kindly affections? What was thus transiently felt under such circumstances in good air was more or less induced permanently where the air is always bad; in this case though there is experienced a reduction of sentiment, there is not a proportionate reduction of thought, on the contrary, there is a greater disposition to think in a certain manner when the emotional part of the brain is sluggish and inactive. In this case there is a tendency to a continuity of feeble, timid, and apprehensive thought, just in the same proportion that the function of the spinal marrow is reduced; so that the effect of watery, stagnant air, is to induce a balance in favour of the thinking part of the brain, while it acts against our emotional or sentimental nature. Hence the cautious thoughtfulness that characterizes the inhabitants of humid atmospheres, and the rash and precipitous character that characterizes those who live in atmospheres where, from the dryness of the air, there is more electrical excitement. The difference of the sparks drawn from the electrifying machine in France and Flanders points out the real cause of the inhabitants of the former being agile and emotional, of the latter being sedative and thoughtful. The effects of wine compared with those of tea and coffee were exactly analogous to those of a dry and

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